

CLAIMS

What is claimed is:

1. An inverter system for delivering energy from a source of direct current (dc) to an alternating current (ac) utility, comprising:
 - a dc/dc converter coupled to the source of dc for synthesizing a time-varying current from the dc;
 - an output inductor coupled to the dc/dc converter; and
 - an inverter coupled to the output inductor for supplying the time-varying current to the ac utility in phase with a voltage of the ac utility.
2. The inverter system of claim 1, wherein the dc/dc converter further comprises:
 - a phase-shifted input bridge coupled to the source of dc;
 - an isolation transformer coupled to the phase-shifted input bridge; and
 - a rectifier coupled to the isolation inductor.
3. The inverter system of claim 2, wherein the phase-shifted input bridge further comprises:
 - a first phase leg; and
 - a second phase leg;wherein the inverter system further includes a controller for controlling a phase relationship between the first and second phase legs of the phase-shifted input bridge to provide the time-varying current.

4. The inverter system of claim 3, wherein the first and second phase legs of the phase-shifted input bridge each comprise a pair of switches, and wherein each switch is selectively actuated by the controller.
5. The inverter system of claim 4, wherein each switch comprises a MOSFET.
6. The inverter system of claim 4, wherein each switch comprises parasitic circuit elements, wherein the isolation transformer comprises parasitic inductances, and wherein the parasitic circuit elements and parasitic inductances reduce switching losses within the dc/dc converter.
7. The inverter system of claim 6, wherein the parasitic circuit elements of each switch comprise a parasitic diode and a parasitic capacitance.
8. The inverter system of claim 4, wherein a switching frequency of the switches is substantially greater than a line frequency of the ac utility.
9. The inverter system of claim 2, wherein the isolation transformer outputs a bipolar time-varying current, and wherein the rectifier converts the bipolar time-varying current to a unipolar time-varying current.
10. The inverter system of claim 9, wherein the output inductor smoothes the unipolar time-varying current.

11. The inverter system of claim 9, wherein the unipolar time-varying current is synchronized with zero-crossings of the ac utility voltage.

12. The inverter system of claim 1, wherein the inverter further comprises:

a first leg including first and second switches; and

a second leg including first and second switches;

wherein the ac utility is coupled to the inverter system between the first and second switches of each leg.

13. The inverter system of claim 12, further comprising:

a controller for switching the switches of the inverter at zero-crossings of the ac utility voltage.

14. The inverter system of claim 13, wherein one switch in each leg of the inverter is forced to conduct during a positive half-cycle of the ac utility voltage, and wherein the other switch in each leg of the inverter is forced to conduct during a negative half-cycle of the ac utility voltage.

15. A method for delivering energy from a source of direct current (dc) to an alternating current (ac) utility, comprising:

synthesizing a time-varying current from the dc using a dc/dc converter;
smoothing the time-varying current; and
supplying the time-varying current to the ac utility in phase with a voltage of the ac utility.

16. The method of claim 15, wherein the dc/dc converter comprises:

a phase-shifted input bridge coupled to the source of dc;
an isolation transformer coupled to the phase-shifted input bridge; and
a rectifier coupled to the isolation inductor;
wherein the method further comprises:
controlling a phase relationship between first and second phase legs of the phase-shifted input bridge to provide the time-varying current at an output of the rectifier.

17. The method of claim 16, further comprising:

reducing switching losses within the dc/dc converter using parasitic circuit elements within the phase-shifted input bridge and parasitic inductances within the isolation transformer.

18. The method of claim 16, further comprising:

outputting a bipolar time-varying current from the isolation transformer; and
converting the bipolar time-varying current to a unipolar time-varying current using the

rectifier.

19. The method of claim 18, wherein the unipolar time-varying current is synchronized with zero-crossings of the ac utility voltage.

20. An apparatus, comprising:

an alternating current (ac) utility;

a source of direct current (dc); and

an inverter system for delivering energy from the source of dc to the ac utility;

wherein the inverter system comprises:

a dc/dc converter coupled to the source of dc for synthesizing a time-varying current from the dc;

an output inductor coupled to the dc/dc converter; and

an inverter coupled to the output inductor for supplying the time-varying current to the ac utility in phase with a voltage of the ac utility.

21. The apparatus of claim 20, wherein the dc/dc converter further comprises:

a phase-shifted input bridge coupled to the source of dc;

an isolation transformer coupled to the phase-shifted input bridge; and

a rectifier coupled to the isolation inductor.

22. The apparatus of claim 21, wherein the phase-shifted input bridge further comprises:

a first phase leg; and

a second phase leg;

wherein the inverter system further includes a controller for controlling a phase relationship between the first and second phase legs of the phase-shifted input bridge to provide the time-varying current.